# CHARACTERISTICS OF FUNGI

## 1. THALLUS ORGANIZATION

- Except some unicellular forms (e.g. yeasts, Synchytrium).
- The fungal body is a thallus called mycelium.
- The mycelium is an interwoven mass of thread-like hyphae (Sing., hypha).
- Hyphae may be septate (with cross wall) and aseptate (without cross wall).
- Some fungi are dimorphic that found as both unicellular and mycelial forms e.g. *Candida albicans*.

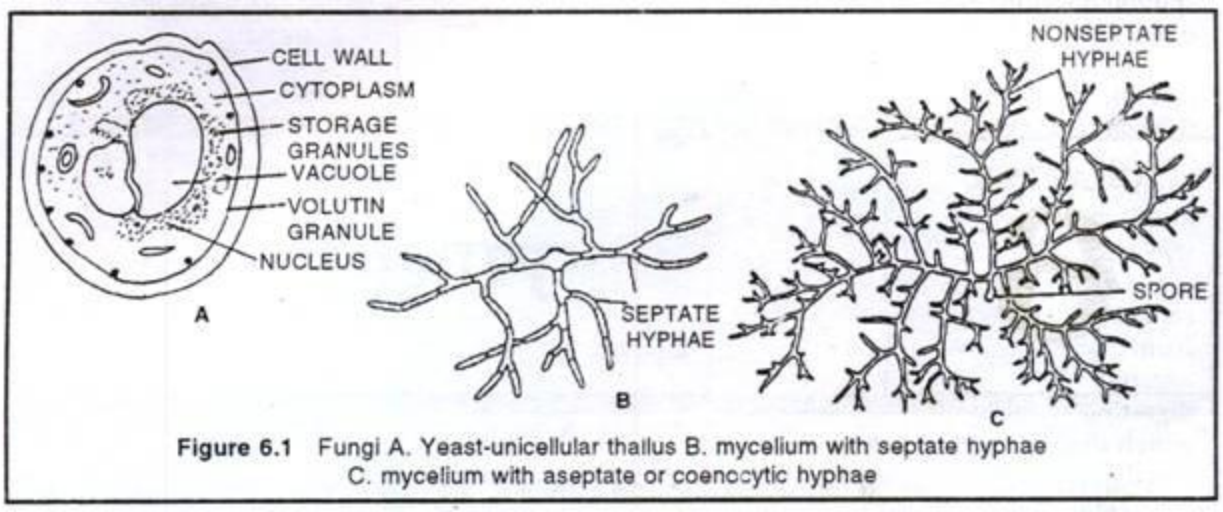



**Figure 6.1** Fungi A. Yeast-unicellular thallus B. mycelium with septate hyphae C. mycelium with aseptate or coenocytic hyphae

## 2. DIFFERENT FORMS OF MYCELIUM

### (a) Plectenchyma (fungal tissue):

In a fungal mycelium, hyphae organized loosely or compactly woven to form a tissue called plectenchyma.

**It is two types:**

**i. Prosenchyma or Prosoplectenchyma:**
In these fungal tissue hyphae are loosely interwoven lying more or less parallel to each other.

**ii. Pseudoparenchyma or paraplectenchyma:**

In these fungal tissue hyphae are compactly interwoven looking like a parenchyma in cross-section.

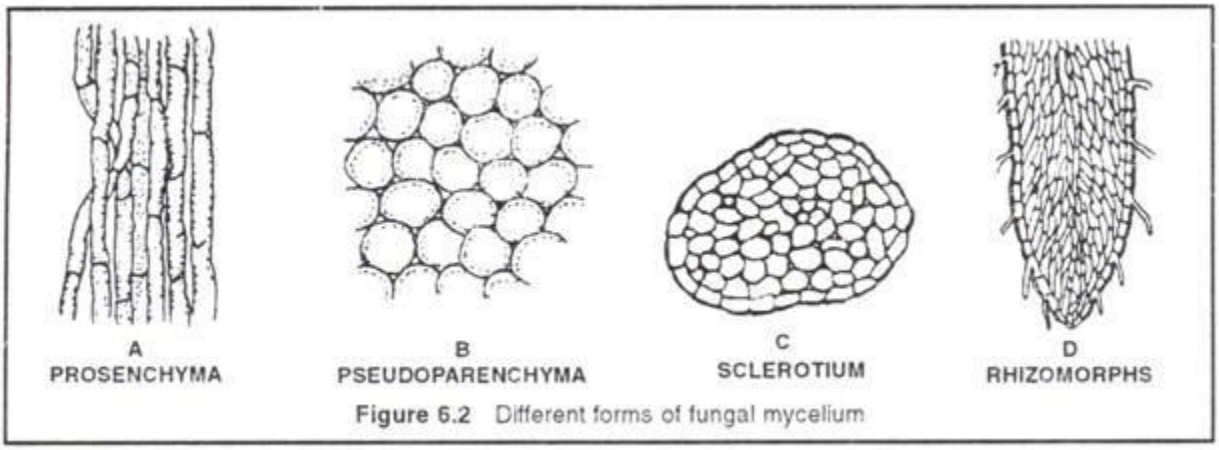


Figure 6.2 Different forms of fungal mycelium

### (b) Sclerotia (Gr. Skleros=haid):

These are hard dormant bodies consist of compact hyphae protected by external thickened hyphae. Each Sclerotium germinates into a mycelium, on return of favourable condition, e.g., *Penicillium*.

**(c) Rhizomorphs:**

They are root-like compactly interwoven hyphae with distinct growing tip. They help in absorption and perennation (to tide over the unfavourable periods), e.g., *Armillaria mellea*.

## 3. NUTRITION

The fungi lack chlorophyll. Therefore, they cannot synthesize their own food.

**Depending on from where and how they get nutrition, fungi are of following types:**

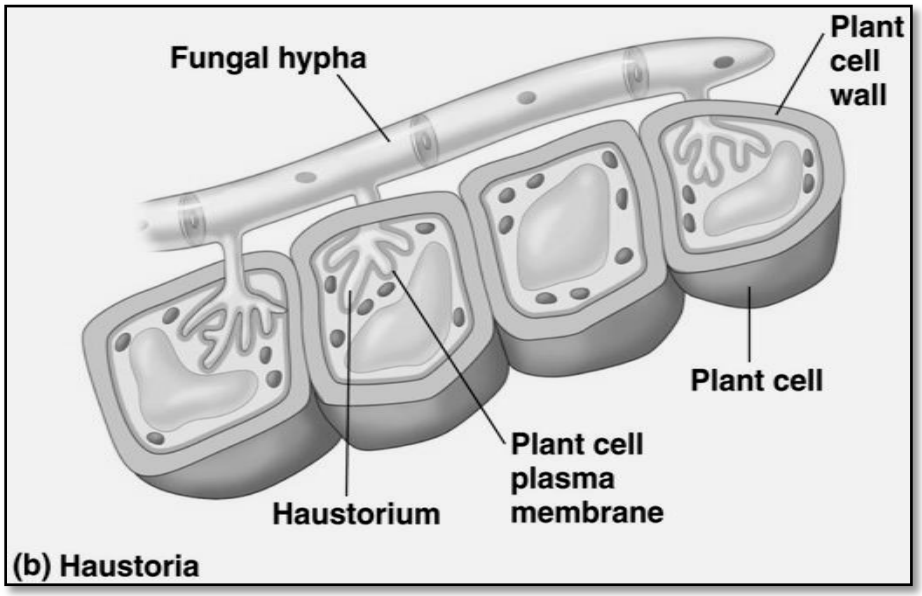
**(a) Saprotrophs (= saprobes):**

They obtain food from dead and decaying organic matter. They secrete digesting enzymes to outside which digest the substratum and then absorb nutrients, e.g., *Mucor*, *Rhizopus* (bread mould) etc.

**(b) Parasitic:**

- They obtain food from living.
- They may be facultative or obligate.
- **Facultative** parasites grow on a variety of tissues and often cause 'soft rot' of the tissue, e.g., *Ustilago*. (In **facultative mutualism**, each organism can survive independently, but it benefits both to remain together.)

- The **obligate**- parasites absorb through specialized haustoria. (In **obligate mutualism**, one organism cannot survive without the other. This term is easy to remember because both organisms are obligated, or forced to, rely on one another).




- The parasitic fungi that grow on surface of host cells and absorb food through haustoria are called **ectoparasites or ectophytic parasites** (e.g., *Mucor, Erisphae*).

- When parasitic fungi grow inside the host tissue arc called **endoparasites or endophytic parasites** (e.g., *Pythium, Puccinia*).

**(b) Predacious:**

Some soil fungi develop ring-like noses to trap annelids, nematodes etc. e.g., *Arthrobotrys, Zoophagus, Dactylella* etc.

**(d) Symbiotic:**

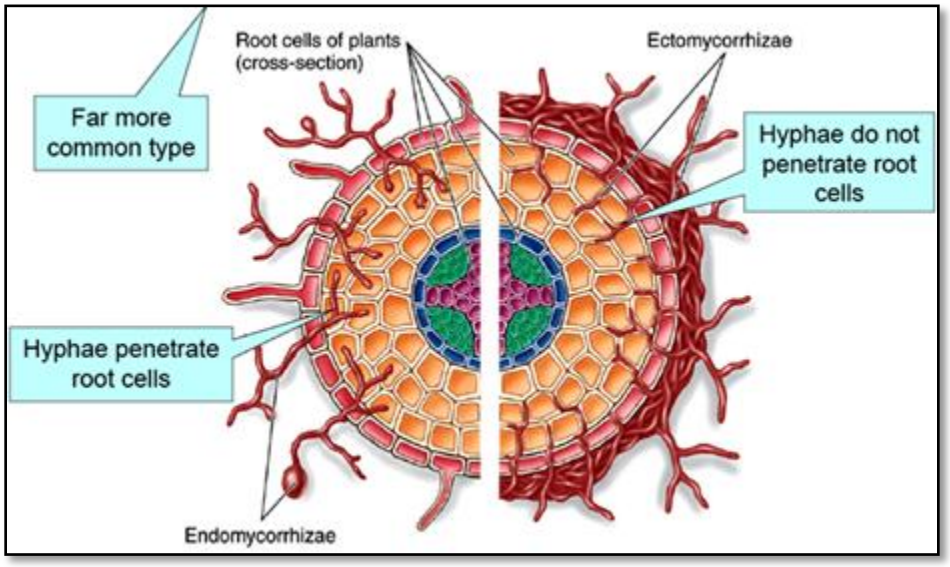
- They live in mutualistic relationship with another organism by which both are benefited.

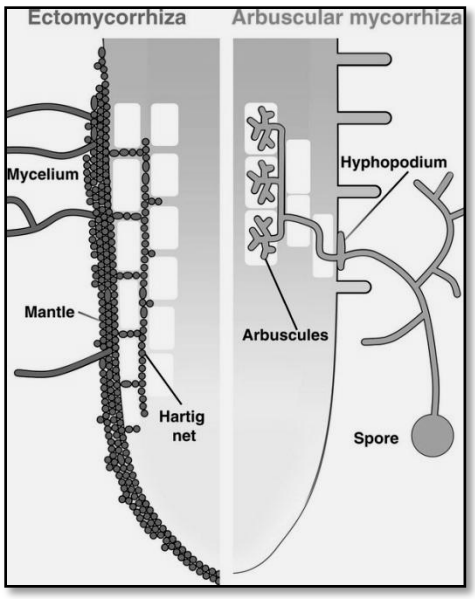
- The two common examples are lichens and mycorrhiza.

- Lichens are symbiotic associations between fungi and algae. The fungal partner is a member of ascomycetes or basidiomycetes that provides water and nutrients, while the algal partner is a green alga or cyanobacteria that prepares food by photosynthesis.

- Mycorrhizas or mycorrhizae (fungus roots in Greek) are the mutualistic symbiotic associations between soil fungi and the roots of most plant species (95% of all plant families are predominantly mycorrhizal). According to the carbohydrate theory (Bjorkman, 1949), the plants that grow in soils deficient in P and N, and high intensity light develop mycorrhizas.

- The two most common types of mycorrhizas are the ectomycorrhizas (ECM) and the endomycorrhizas (also known as arbuscular mycorrhiza, AM or VAM).






- The two groups are differentiated by the fact that the hyphae of ectomycorrhizal fungi do not penetrate the cell wall of the plant's root cells,
- While the hyphae of arbuscular mycorrhizal fungi penetrate the cell wall.

## 4. HETEROTHALLISM AND HOMOTHALLISM

- F. Blakeslee (1904) discovered mating types or genetically distinct strains in Mucor.
- He called fungi with different mating types are called heterothallic and
- Fungi without mating types are called homothallic.
- Nowadays we call some fungi and algae homothallic if both male and female gametes produce in the same individual can fertilize each other and
- Heterothallic if the gametes can only be fertilized by gametes from another individual of the same species.

- Heterothallism introduces variations in the species.

## 5. REPRODUCTION:

Like most other thallophytes, fungi also reproduce by vegetative, asexual and sexual means. However, asexual reproduction is generally predominant depending upon the involvement of the entire thallus or a part of it, the fungi may be holocarpic or eucarpic.

### (i) Holocarpic:

In this category of fungi the entire thallus gets converted into one or more reproductive bodies. Hence, the vegetative and reproductive phase can never occur at the same time.

### (ii) Eucarpic:

Most of the fungi are eucarpic. Here only a part of the thallus is involved in the development of reproductive organs and remaining thallus remains vegetative. In eucarpic fungi, vegetative and reproductive phases exist at the same time.

**The various methods of sexual reproduction in fungi are as follows:**

### (i) Planogametic copulation:

This is simplest type of sexual reproduction. In this process fusion of two gametes of opposite sex or strains takes place where one or both of the fusing gametes are motile (flagellated). It results in the formation of a diploid zygote.

**This process is usually of three types:**

### (a) Isogamy:

In this process fusing gametes are morphologically similar and motile but physiologically dissimilar. These gametes are produced by different parents e.g. *Synchytrium*.

**(b) Heterogamy:**

- When the fusing gametes are morphologically as well as physiologically different, the process is known as heterogamy.

- Heterogamous reproduction is of two types: anisogamy and oogamy.

- **Anisogamy** consists of the fusion of two motile gametes where the male gamete is small and more active than the female gamete, e.g., *Allomyces*.

- In **oogamy** the motile male gamete (antherozooid) fuses with the large, non-motile female gamete (egg or ovum), *Monoblepharis*, *Synchytrium* etc.

**(ii) Gametangial contact:**

In this process two gametangia of opposite sex come in contact with one another. The male gametangium (antheridium) transfer male nucleus or gamete into the female gametangium (oogonium) either through a pore at the point of contact or through a fertilization tube, e.g., *Phytophthora, Sphaerothera, Albugo, Pythium* etc.

**(iii) Gametangial copulation:**

It involves the fusion of entire contents of two gametangia to form a common cell called zygote or zygospore, e.g., *Mucor, Rhizopus*.

**(iv) Spermatization:**

Some fungi produce many minute, spore-like, single-celled structures called spermatia (nonmotile gametes). These structures are transferred through agencies like water, wind and insects to either special receptive hyphae or trichogyne of ascogonium. The contents migrate into receptive structure. Thus dikaryotic condition is established, e.g. *Puccinia*.

### (v) Somatogamy:

This takes place in fungi where formation of gametes is absent. In such fungi, anastomoses takes place between hyphae and their somatic cells fuse to produce dikaryotic cells, e.g, *Agaricus*, *Peniophora* etc.